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Research Paper :

Study of effect of packaging and storage on the quality of onion powder prepared by osmotic dehydration

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ABSTRACT

Onion powder prepared from 5 mm thick osmotic dried onion slices after drying in cabinet dryer at 60^0 C up to moisture content 4 per cent, grinding in mixer and sieving with 30 mesh sieve, can be stored up to 2 months in 400 gauge LDPE, 200 gauge HDPE, and aluminum foil pouches. During storage at room temperature there was slight increase in physico-chemical composition of onion powder dried by osmotic dehydration. In case of packaging material aluminum foil pouches showed better result followed by 200 gauge HDPE pouches and 400 gauge LDPE pouches. The retention of pungency was maximum in N-53 (red) variety osmotic dried onion powder.

Key words : Onion, Storage, Package, Dedydration

There are several dehydration units in India, which produce dehydrated onion flakes for export as well as for domestic consumption. But during mechanical drying of white and red onion flakes, pink discoloration often adversely affects the quality of dried onion. Recently osmotic drying, which is the process of water removal, is used. During osmotic processing water flows from the product in to the osmotic solution, where osmotic solute is transferred from the product in to the product.

Like any other powder, onion powder prepared from osmotic dehydrated onion slices also undergo lots of physical and chemical changes if it is not properly packed and stored. These changes can be controlled after providing adequate packaging (Sagar, 2001). Most of onion dehydration unit are using white onion cultivars for processing. But the production of white onion, in India is less as compared to red onion cultivars. The N-53 variety of red onion cultivar is popular, most of farmers prefer to grow N-53 variety. After harvesting of onion in particular season, onions are available in huge quantity. The storage structure for storage of onion are inadequate and fresh onion can not be easily stored more than 3 months. Therefore, there is wastage of onion in large quantity.

METHODOLOGY

Medium to large size of onion bulbs of four cultivars were procured from different farmers field. After peeling, onion bulbs were cut into slices of 5 mm thickness. The drying was carried out by osmotic drying process. In osmotic drying the onion slices were placed in container holding 15 per cent common salt at ambient temperature. The slices were stirred at regular interval up to 6 hr. After 6 hr the slices were removed quickly and drained. The drained slices were placed in aluminum trays. The drying was carried out in hot air tray dryer at 60^0 C and it was continue until moisture content of slices become 4 per cent. Slices were powdered by grinding in mixer, followed by sieving with 30-mesh sieve. Onion powder was packed in 400 gauge LDPE, 200 gauge HDPE and aluminum foil pouches. The powder was stored at room temperature and product was analyzed up to two months with one month interval.

Five sample of onion bulbs from each cultivar were selected for measurement of physical characteristics such as average bulb weight, polar diameter, equatorial diameter, geometric diameter, skin colour, average bulb size (LxB), shape index. Moisture content of was determined by drying the sample to constant weight in hot air oven. Total soluble solids was measured by using Erma made hand refractometer ($0\text{-}32^0$ Bx), ash content was measured by the method of Rangnna (1986). Pungency in terms of pyruvic acid was estimated by method given by Schwimmer and Weston (1962). Reducing and total sugar were determined by titrating the samples against Fehling's solution using methylene blue as an indicator (Lane and Eynon, 1923). Non enzymatic browning in onion powder was measured in terms of optical density at 440 nm of an aliquot of 60 per cent alcoholic extract (Rangnna 1986).

RESULTS AND DISCUSSION

The findings of the present study as well as relevant

discussion have been summarized under following heads:

Physical characteristics of onion varieties:

The physical characteristics of onion varieties used for drying studies are tabulated in the Table 1. It can be seen from Table 1, that Parbhani local has maximum polar diameter (6.97cm), equatorial diameter (6.02cm), geometric diameter (6.54 cm) and bulb weight (80.2 g). The average bulb weight was observed in the range 56.4 to 80.2 g of different varieties in present study. It may be due to varietal difference and agro climatic condition. Generally 5-6 cm diameter with full globe shape are preferred for dehydration to facilitate handling in slicing machine.

Chemical characteristics of onion varieties:

The chemical characteristics of onion varieties are tabulated in Table 2. It revels that Dhanluxmi variety has maximum moisture content (88.35per ecnt) whereas Parbhani local has maximum TSS (13.52^0 Bx) and it is suitable for dehydration. Fursangi has maximum total ash content (0.65 per ecnt), reducing sugar (3.22 per ecnt) and total sugar (6.42 per cent) Pungency (pyruvic acid) of onion is an important trait and imparts characteristics flavour during dehydration. This was found to be highest in N-53 (102 micro mole/ g) and lowest in Fursangi (60.6 micro mole/ g). Singh and Kumar (1984) reported that retention of pungency in red varieties was found better than in white ones. The total ash content in the present study was observed in the range 0.48 to 0.65 per cent.

Physico-chemical characteristics of osmotic dried onion powder:

The Table 3 shows that physico-chemical characteristics of osmotic dried onion powder. It was observed that Dhanluxmi variety had maximum moisture content (4.82per ecnt). The N-53 variety had maximum pungency (34.52 micro mole /g) and NEB (48.6) where as Fursangi variety had maximum reducing sugar (2.64 per cent), total sugar (5.94 per cent) and total solids (96.31 per cent).

Effect of drying methods on chemical composition of onion powder during storage:

The effect of packaging material on the quality and storability of onion powder in terms of change in moisture content, pyruvic acid, reducing sugar, total sugar and non enzymatic browning (NEB) are given in Table 4. It has been observed that, there was continuous picking of moisture by product in all samples during storage. The gain of moisture was high in 400 gauge LDPE followed by 200 gauge HDPE and aluminum foil pouch. It may be due to more absorption of moisture from atmosphere by powder.

In respect of packaging material the sample stored in higher gauge of polyethylene bag gained less moisture for all varieties as compared to lower gauge. It may be due to lower permeability to water vapour at higher gauge.

Pungency, reducing sugar, total sugar also increased slightly during storage in respect of packaging material. Retention of pungency was more in aluminum foil

Table 1 : Physical characteristics of onion varieties

Sr. No.	Variety	Average bulb weight (g)	Polar diameter (cm)	Equatorial diameter (cm)	Geometric diameter (cm)
1.	N-53	56.4	5.78	5.4	5.64
2.	Dhanluxmi	60.0	6.08	5.48	5.86
3.	Parbhani Local	80.2	6.97	6.02	6.54
4	Fursangi	78.5	6.2	6.02	6.12
	S.E.±	3.85	0.188	0.115	0.137
	C.D. (P=0.05)	11.53	0.563	0.345	0.412

Table 2 : Chemical characteristics of onion varieties

Sr. No	Variety	M. C. (%) (wb)	Total solids (%)	TSS (^{0} Bx)	Ash content (%)	Pyruvic acid (micro mole/g)	Reducing sugar (%)	Total sugar (%)
1.	N-53	85.98	14.01	9.92	0.48	102	2.38	5.29
2.	Dhanluxmi	88.35	11.65	10.7	0.52	100	2.56	5.50
3.	Parbhani Local	86.45	13.54	13.52	0.59	97	3.12	6.26
4	Fursangi	82.78	17.22	11.85	0.65	60.6	3.22	6.42
	S.E.±	0.558	0.223	0.285	0.023	0.908	0.062	0.893
	C.D. (P=0.05)	N.S.	N.S.	N.S.	N.S.	2.718	0.188	0.267

NS – Non significant

Table 3 : Physico-chemical characteristics of osmotic dried onion powder

Sr. No.	Variety	Moisture content (%)	Total Solids (%)	Pungency (Pyruvic acid) (micro mole/gm)	Reducing sugar (%)	Total sugar (%)	Non-enzymatic browning at 440 nm
1.	N-53	3.80	96.18	34.52	1.96	5.02	48.6
2.	Dhan- Luxmi	4.82	95.17	27.22	2.00	4.92	32.8
3.	Parbhani local	3.68	96.32	29.94	2.50	5.90	28.0
4.	Fursangi	3.67	96.33	28.83	2.64	5.94	18.8
5.	S.E.±	0.142	0.142	0.244	0.080	0.090	1.129
6.	C.D. (P=0.05)	NS	NS	0.730	0.242	0.269	3.380

NS-Non significant

Table 4 : Changes in chemical composition of osmotic dried onion powder stored at room temperature

Sr. No.	Variety	Storage period (month)	Packaging material	M.C. (%)	Pyruvic acid (micro mole/g)	Reducing sugar (%)	Total sugar (%)	NEB
1.	N-53	0	--	3.81	34.52	1.96	5.02	48.60
			400 g LDPE	4.70	32.95	2.25	6.25	51.00
		1	200 g HDPE	4.25	33.40	2.10	6.00	50.25
			Aluminum foil pouch	4.00	33.75	2.0	5.40	49.00
		2	400 g LDPE	4.90	33.05	2.53	6.45	52.30
			200 g HDPE	4.53	33.65	2.34	6.20	51.50
			Aluminum foil pouch	4.25	34.00	2.15	5.65	50.80
2.	Dhan-	0	--	4.82	27.02	2.0	4.92	32.80
	Luxmi		400 g LDPE	5.15	25.60	2.63	5.80	35.00
		1	200 g HDPE	4.98	26.00	2.45	5.45	34.30
			Aluminum foil pouch	4.80	26.40	2.00	5.00	33.00
		2	400 g LDPE	5.65	26.00	2.85	6.03	36.30
			200 g HDPE	5.12	26.35	2.67	5.73	35.00
			Aluminum foil pouch	5.00	26.95	2.20	5.15	33.50
3.	Parbhani	0	--	3.68	29.94	2.5	5.9	28.20
	Local		400 g LDPE	4.50	26.75	3.20	7.00	29.80
		1	200 g HDPE	4.15	27.00	3.00	6.20	29.20
			Aluminum foil pouch	3.90	28.00	2.60	6.00	28.50
		2	400 g LDPE	4.85	27.30	3.40	7.15	30.17
			200 g HDPE	4.52	27.50	3.10	6.80	29.82
			Aluminum foil pouch	4.07	28.70	2.83	6.13	29.00
4.	Fursangi	0	--	3.67	28.83	2.64	5.94	18.80
			400 g LDPE	4.15	26.00	3.15	6.95	21.00
		1	200 g HDPE	4.00	26.50	3.00	6.40	19.50
			Aluminum foil pouch	3.70	27.00	2.25	5.80	19.00
		2	400 g LDPE	4.70	26.83	3.53	7.20	21.52
			200 g HDPE	4.35	27.00	3.14	6.95	20.00
			Aluminum foil pouch	4.00	27.65	2.98	6.04	19.55

followed by 200 gauge HDPE then 400 gauge LDPE. It may be due to gain of moisture by packaging material. Reducing sugar and total sugar content which is essential to maintain browning of dehydrated product was lower in sample stored in higher gauge in comparison to lower gauge.

NEB was more in 400 gauge LDPE followed by 200-gauge HDPE and aluminum foil pouch. It may be due to low moisture content in 200 gauge HDPE pouch which happen to maintain better colour of product.

In respect of packaging material the aluminum foil pouches showed better result followed by 200 gauge HDPE pouches and 400 gauge LDPE pouches.

Conclusion:

The retention of pungency was maximum in N-53 (red) variety osmotic dried onion powder. During storage at room temperature there was slight increase in physico-chemical composition in osmotic dried onion powder. In case of packaging material aluminum foil pouches showed better results followed by 200 gauge HDPE pouches and 400 gauge LDPE pouches. N-53 (red) variety after osmotic dried can be stored up to 6 months.

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